

## Breaking Numbers Apart to Solve 2-Digit Multiplication Problems

Solving 2-digit by 2-digit problems is a major step toward computational fluency in multiplication. When students have fluent strategies for these problems, they have learned basic approaches that can be applied to any multiplication problem. Learning to solve multiplication problems that involve two 2-digit numbers, builds on all the previous work in multiplication. It especially builds on knowledge of multiplication combinations, multiplying by multiples of ten, applying the distributive property to break numbers apart, and estimating.

When students first encounter problems with two 2-digit numbers, it is likely that some students will break apart one of the factors by place value and multiply the other factor by each 10 and then the remaining 1s.

$$46 \times 37 =$$

$$10 \times 37 = 370$$

$$10 \times 37 = 370$$

$$10 \times 37 = 370$$

$$10 \times 37 = 370$$

$$6 \times 37 = ?$$

$$6 \times 30 = 180$$

$$6 \times 7 = 42$$

$$46 \times 37 = 1,702$$

Some students may begin by breaking one of the factors apart by place and then realize that they also need to break the other factor apart in order to complete the multiplication.

$$46 \times 37 =$$

$$46 \times 30 = ?$$

$$40 \times 30 = 1,200$$

$$6 \times 30 = 180$$

$$46 \times 7 = ?$$

$$40 \times 7 = 280$$

$$6 \times 7 = 42$$

$$46 \times 37 = 1,702$$

Keep in mind that breaking up both numbers in such a problem, solving subproblems correctly, keeping track of all the parts, and recombining them to find the solution represents a major increase in complexity for many students. Keeping track of the parts of these problems by thinking about equal groups is critical for many students. Story contexts and visual representations help them do that. For example, here is Anna's story problem:

*There are 46 soccer teams, and each team has 37 players. How many soccer players are there?*

Referring to the story context helps students visualize the multiplication that needs to take place in order to account for all of the groups in the problem.

Let's use Anna's story about 46 teams with 37 players on each. When you multiply  $40 \times 30$ , how many teams have players now? (40) How many players on each of those 40 teams? (30) Is that enough yet? How many more players need to be put on each team? (7 more) So now you have 40 teams with 37 players each. How many more teams do you still need to make? (6 more teams of 37) How will you do that?

Team 1	30 People	?
Team 2	30 People	?
Team 3	30 People	?
Team 4	30 People	?
...	...	...
...	...	...
Team 39	30 People	?
Team 40	30 People	?
Team 41		
Team 42		
Team 43		
Team 44		
Team 45		
Team 46		

Some students may make the common mistake of breaking both factors apart by place, as in the solution above, but solving only part of the problem.

$$40 \times 30 = 1,200$$

$$\underline{6 \times 7 = 42}$$

$$46 \times 37 = 1,242$$

If that is the case, focus students' attention on the size of their answer and give them time to compare this solution with the other solutions as well as with the estimates they made earlier. Give students time to puzzle through why this solution does not work with one of the story contexts that was offered earlier. For example:

**If we have 40 teams of 30 and 6 teams of 7, what would that look like? Would you have equal-sized teams? What would you have to do to make sure that every team has 37 players?**